

High-Speed Rail Network in Japan

January 7, 2010

Ministry of Land, Infrastructure, Transport and Tourism

Contents

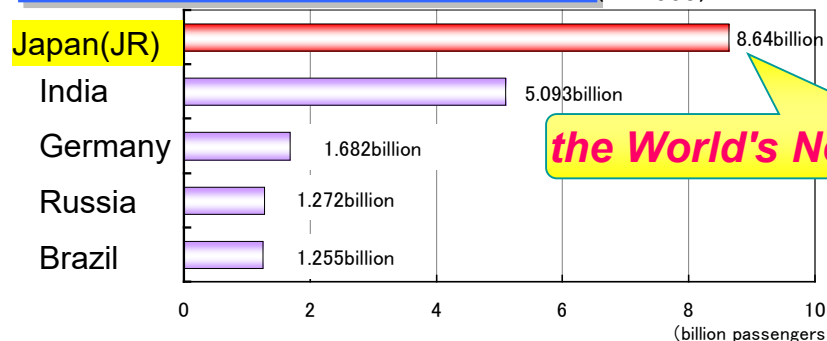
1. Japan's HSR --- Shinkansen's Profile
2. Main Features of Shinkansen
3. Effects of HSR

1. Japan's HSR

General Features of Japanese Railroad

Annual Passenger Transportation

(FY2003)

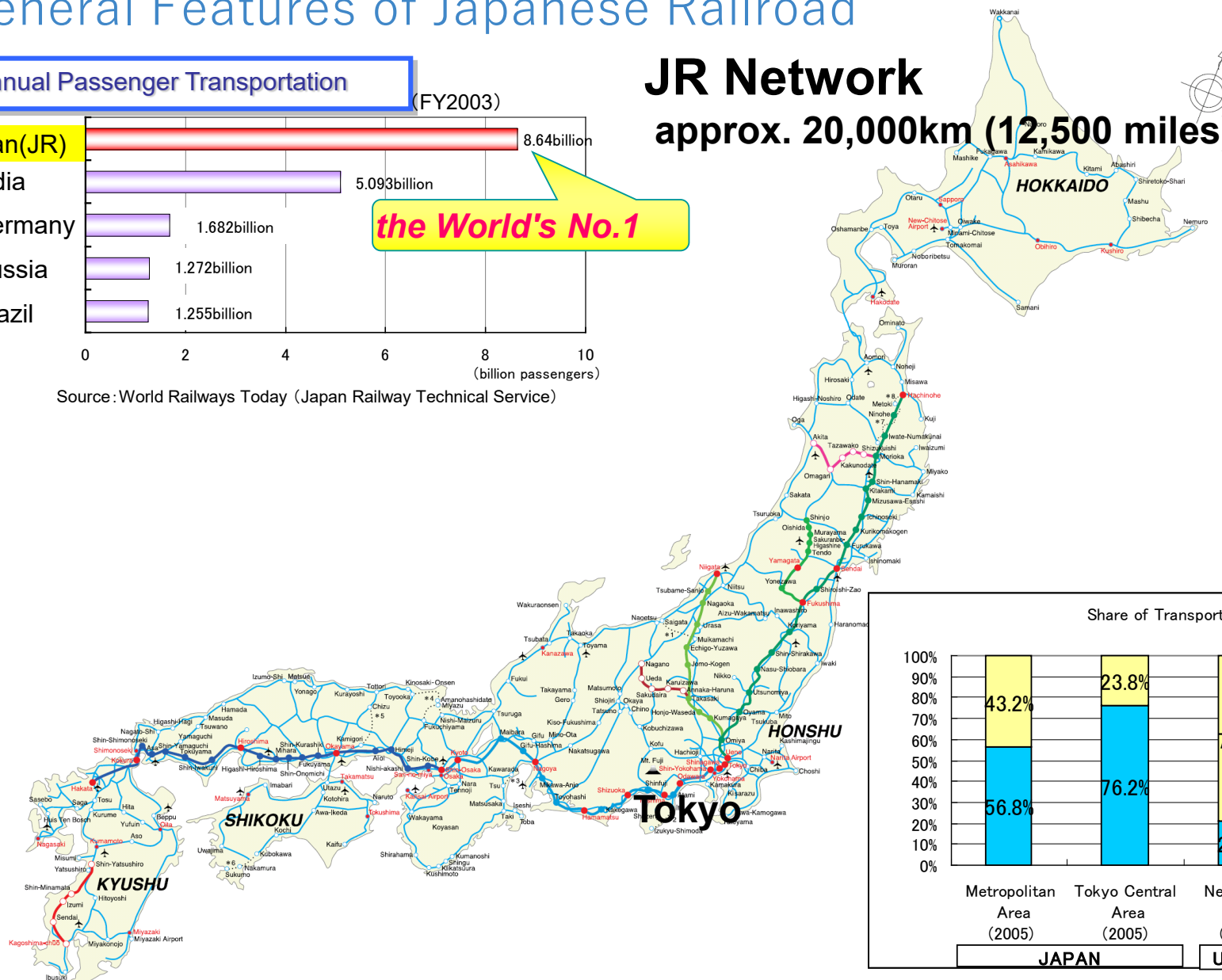


the World's No.1

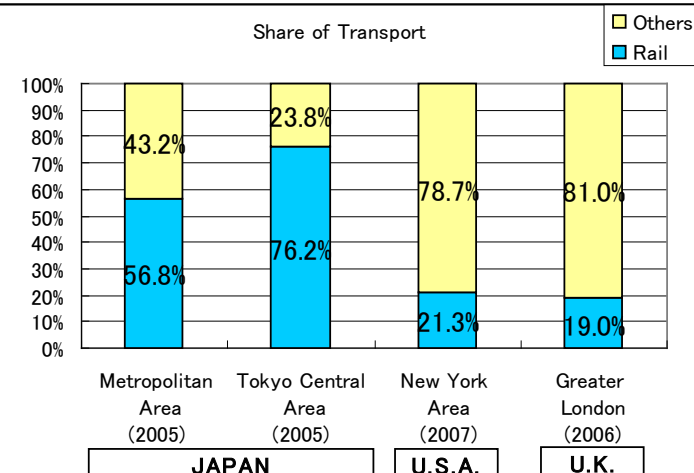
Source: World Railways Today (Japan Railway Technical Service)

JR Network

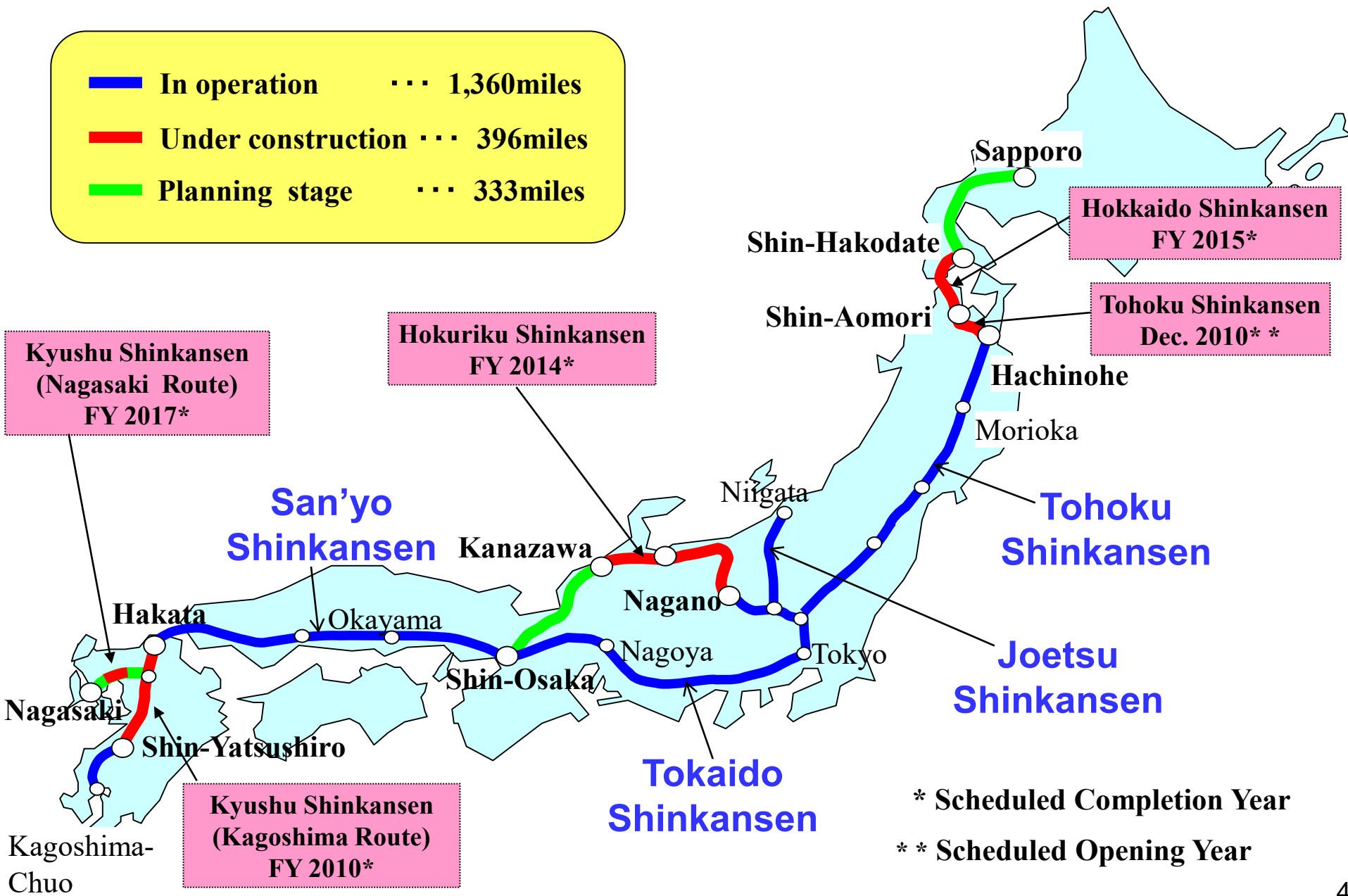
approx. 20,000km (12,500 miles)



Share of Transport



Shinkansen Network



Japan National Railways(JNR) (public company)

construction, ownership and operation

1987 JNR Reform

JNR was privatized and divided into 7 companies.

6 passenger railway companies

Hokkaido Railway Co.
East Japan Railway Co.
Central Japan Railway Co.
West Japan Railway Co.
Shikoku Railway Co.
Kyushu Railway Co.

1 freight railway company

Japan Freight Railway Co.

- ◆ 3 companies were excluded from the jurisdiction of the JR Law in 2001
- ◆ Completion of selling the stocks owned by the government
 - JR East : in 2002
 - JR Central : in 2006
 - JR West : in 2004

(FY2008)

	JR East	JR Central	JR West
Operating Revenues (\$ million)	21,860	13,790	9,722
Operating Income (\$ million)	4,063	4,023	1,133
Ordinary Income (\$ million)	2,900	2,223	816

(\$1=¥90)

1959 ~

Tokaido, Sanyo, Tohoku, & Joetsu Shinkansen
: Covered mainly by Loan



After the Reform of Japanese National Railways (JNR)
in 1987

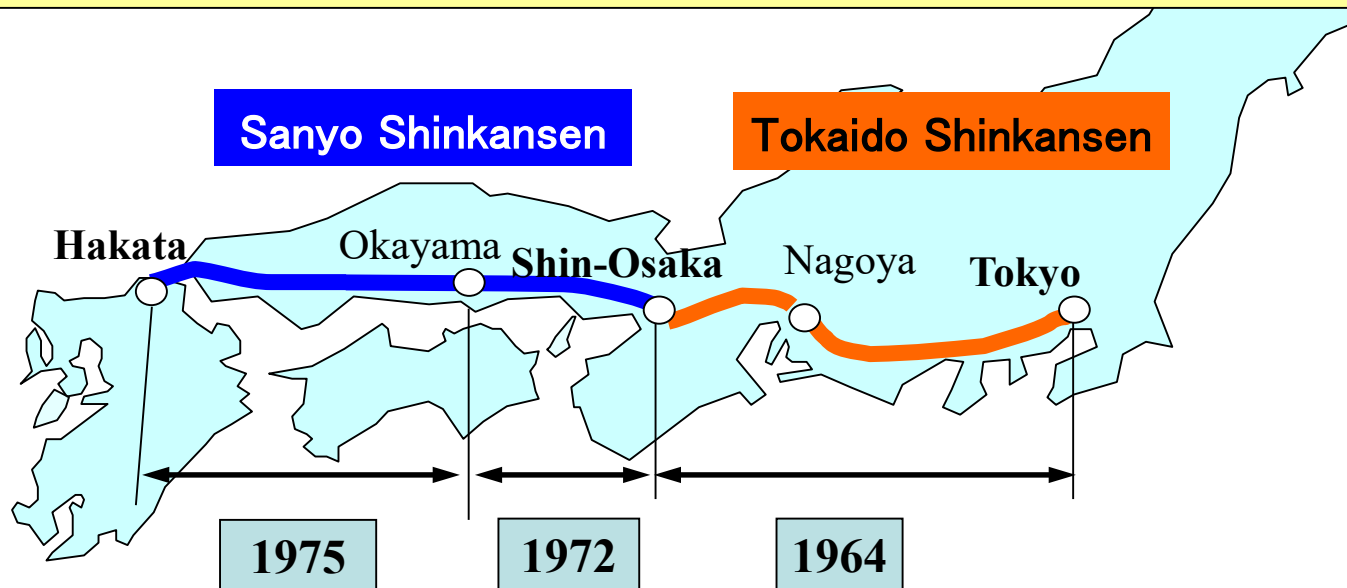
~ Today

Shinkansen has been constructed as public works.
: Covered mainly by
Subsidies from the National & Local Governments

Reform

Tokaido-Sanyo Shinkansen

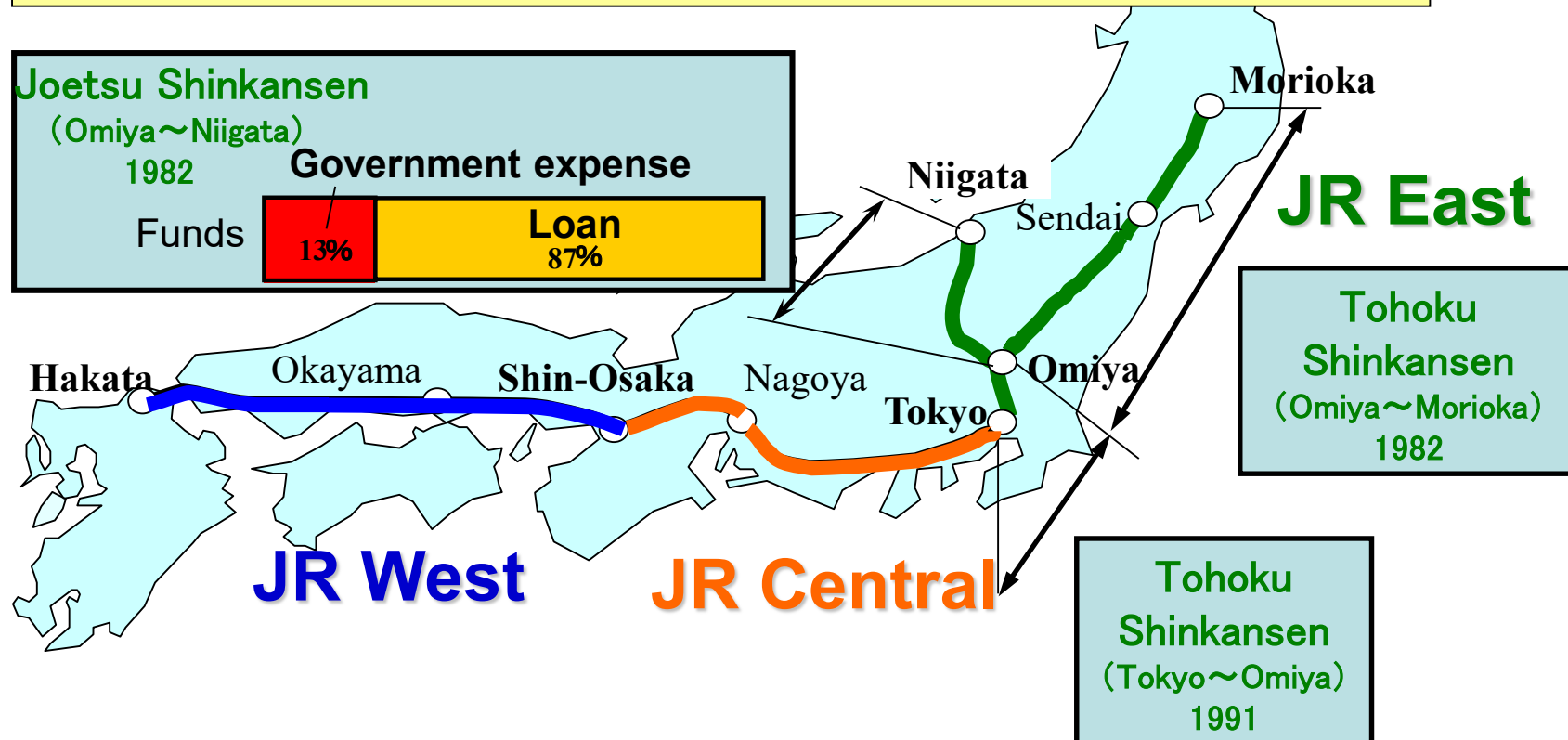
- **No Legal Scheme** Specific to Shinkansen Construction
 - JNR constructed them as track additions to conventional lines.
- The construction cost was covered by **loan with interest**.
- For Tokaido Shinkansen, **the World Bank (IBRD) Loan** amounting to 28.8 billion yen (\$80 million) was provided, which was about 7.5% of the total cost (about 380 billion yen).



Reform

Tohoku-Joetsu Shinkansen

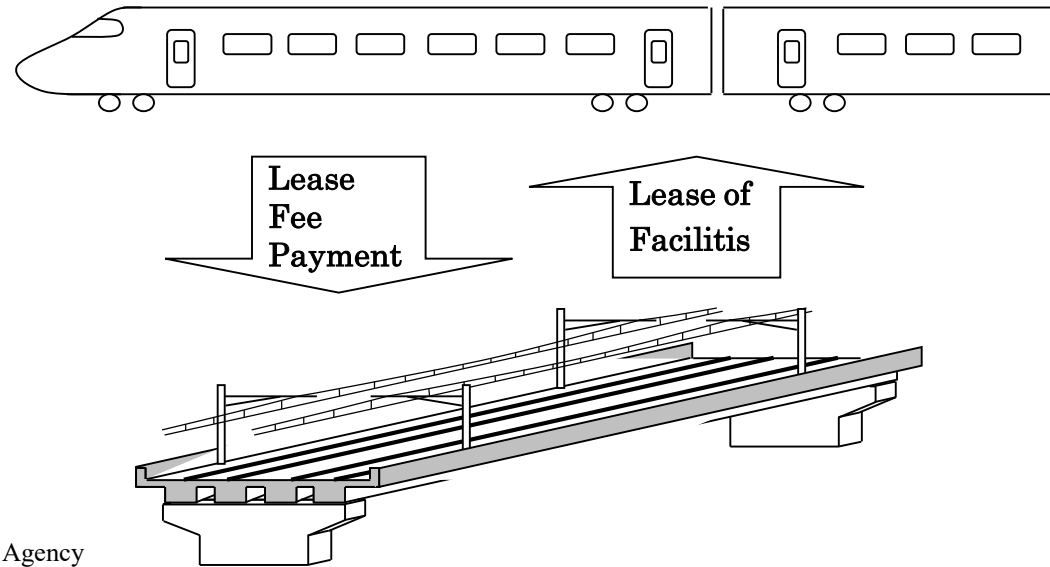
- Tohoku Shinkansen (Tokyo-Morioka) & Joetsu Shinkansen (Omiya-Niigata) were constructed by **JNR & Japan Railway Construction Public Corporation (JRCC)** under the Nationwide Shinkansen Railway Development Law, enforced in 1970.
- The government paid part of the construction costs, but most was covered by **loan with interest**.



○ Separation of construction and operation

JR (Private Company)
(Operation of the Shinkansen)

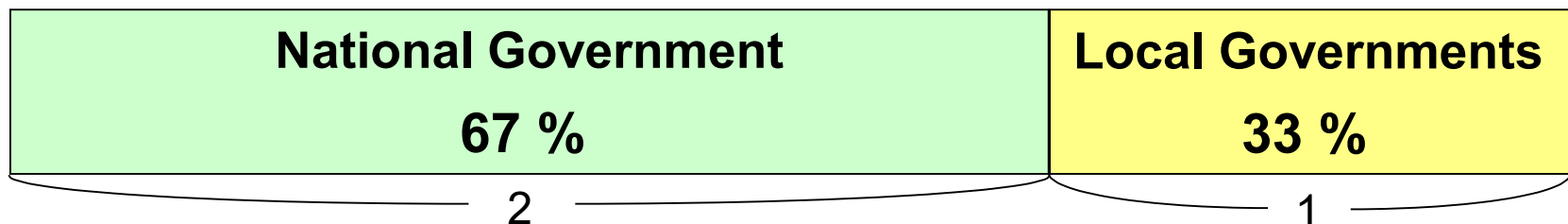
JRTT* (Government Agency)
(Construction and ownership of
Infrastructure)



*JRTT: The Japan Railway Construction, Transport and Technology Agency

○ Financing

- National (2/3) and local (1/3) governments bear financing burden for the Shinkansen infrastructure. **(Public works)**



- **Stable financial resources**

- **Profitability**

 - Annual profit of operator > 0

 - (average over the next 30 years after opening)

- **Investment effect**

 - Benefit/Cost > 1

 - (Effect of saving travel time, etc.)

- **Consent of JR**

- **Consent of the local government for terminating JR operation of the current conventional line**

2. Main Features of the Shinkansen



Safety

**No passenger fatalities
in 45 years**



Reliability

Average delay time:
Under 1 min



Environmentally Friendly

**Low CO2 emission
Low Noise**



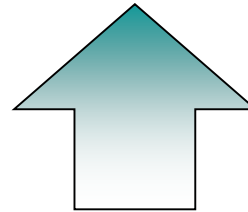
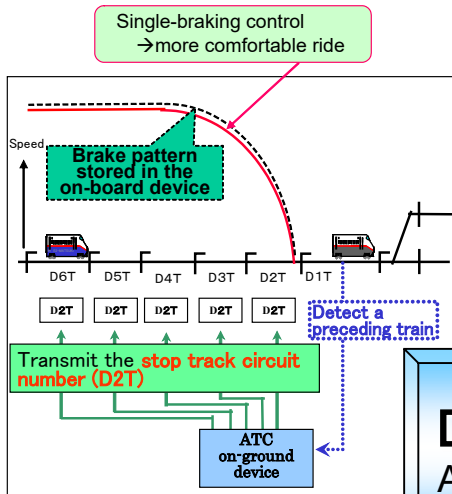
High Density & Mass Transit

Up to 14 trains leave in an hour
Approx. 830,000 passengers
Per day

Safety

Fatal accidents to date: **ZERO**

No fatalities in the 45 years since the start of operations in 1964



Digital -ATC

Automatic train control device

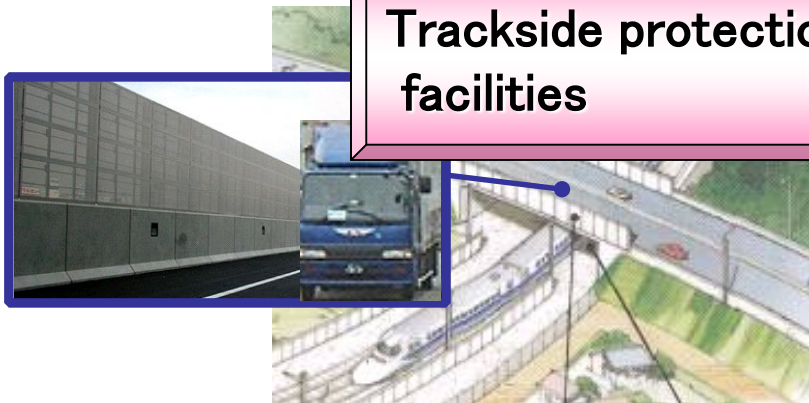
COMTRAC / COSMOS

Traffic control system

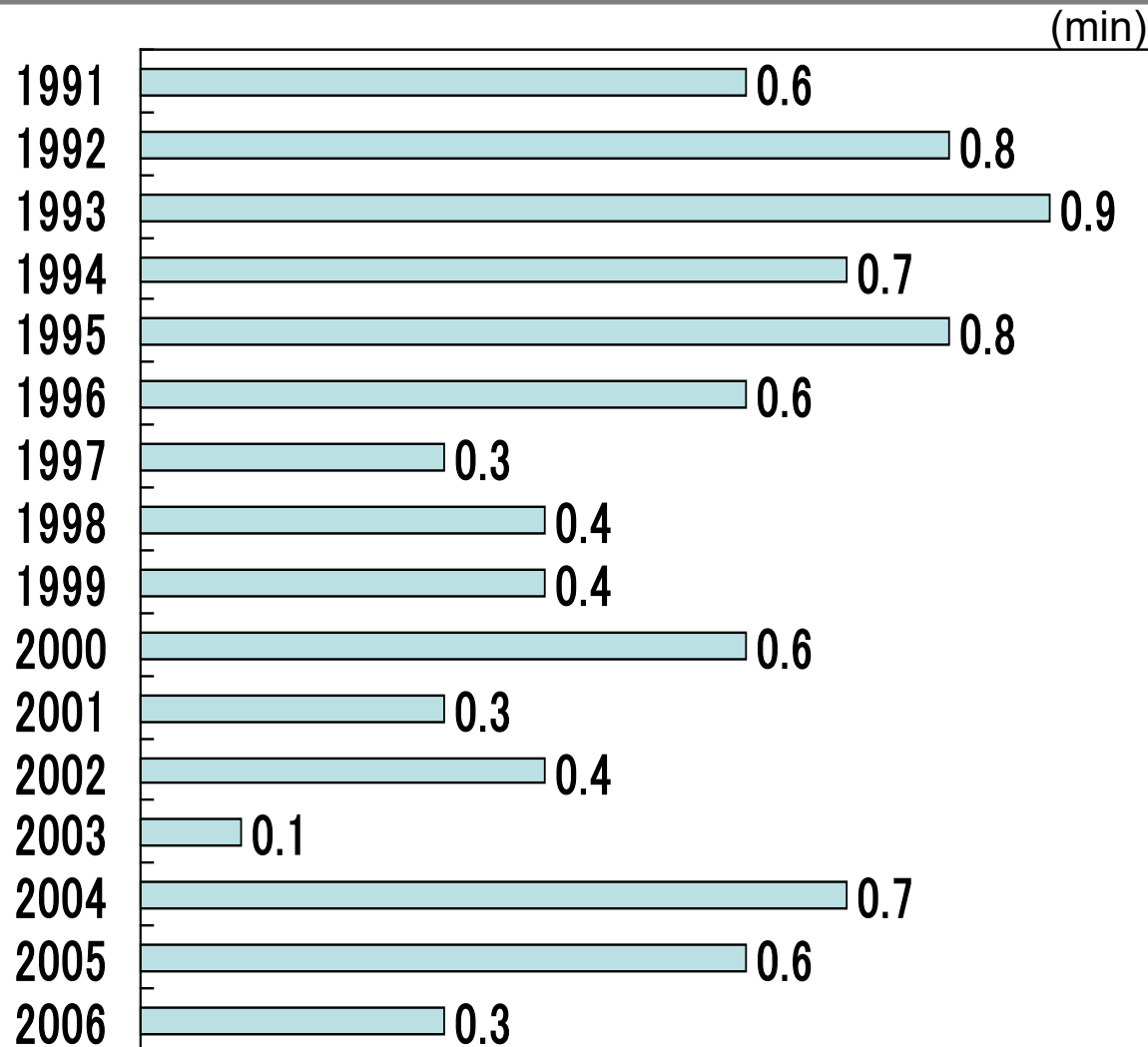
Trackside protection facilities

High speed inspection train

Electric/track inspection system



■ Average delay time: **Under 1 min**



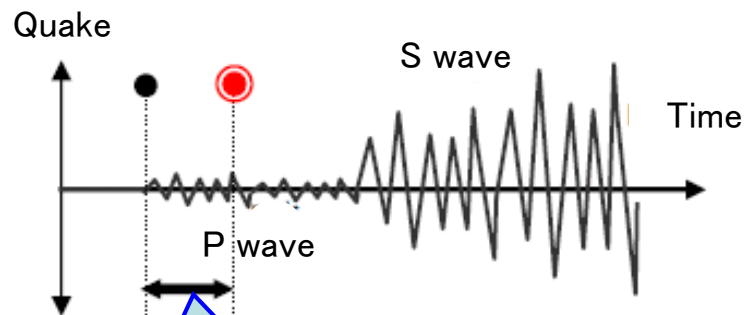
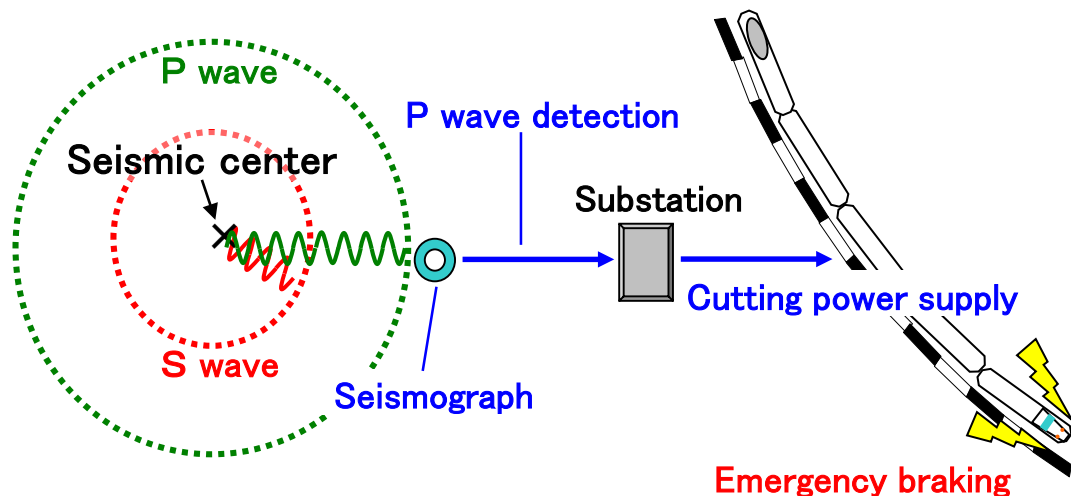
Data: Tokaido Shinkansen

Reducing estimation time for Urgent Earthquake Detection

【Earthquake Detection System】

1. Detect primary waves, which are preliminary tremors
2. Predict scale of the earthquake
3. If a large-scale earthquake is predicted, trains will be automatically stopped by the terminating of power transmission before the secondary wave — a quake causing major damage — arrives.

- P wave: approx 7km/s
- S wave: approx 4km/s



Reducing time for estimation
3 sec. \Rightarrow 2 sec.

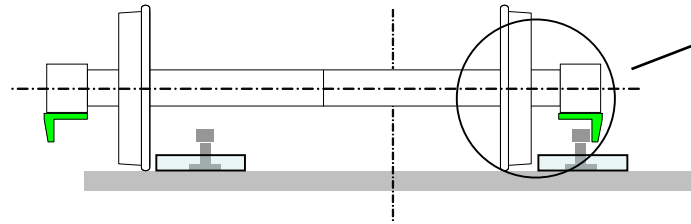
- Accession of the wave
- P wave alarm



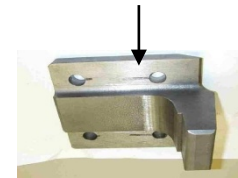
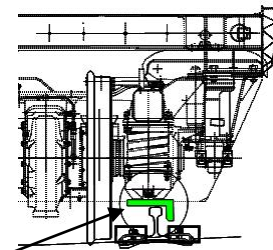
Deviation/Derailment Preventive Measures

L-shape car guide

Measure for preventing a derailed train from running out of the track widely, using an L-shape car guide installed with the bogie, which gets stuck on the rail.



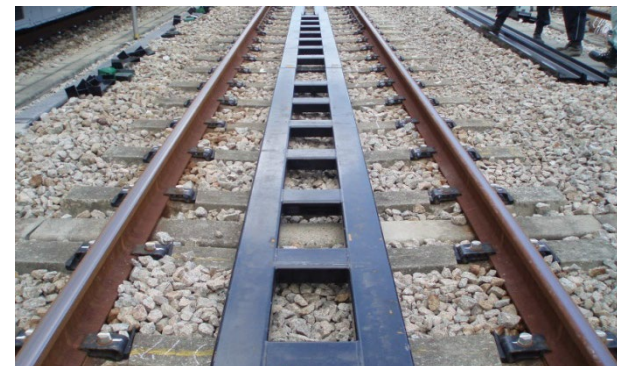
Shinkansen Car Bogie



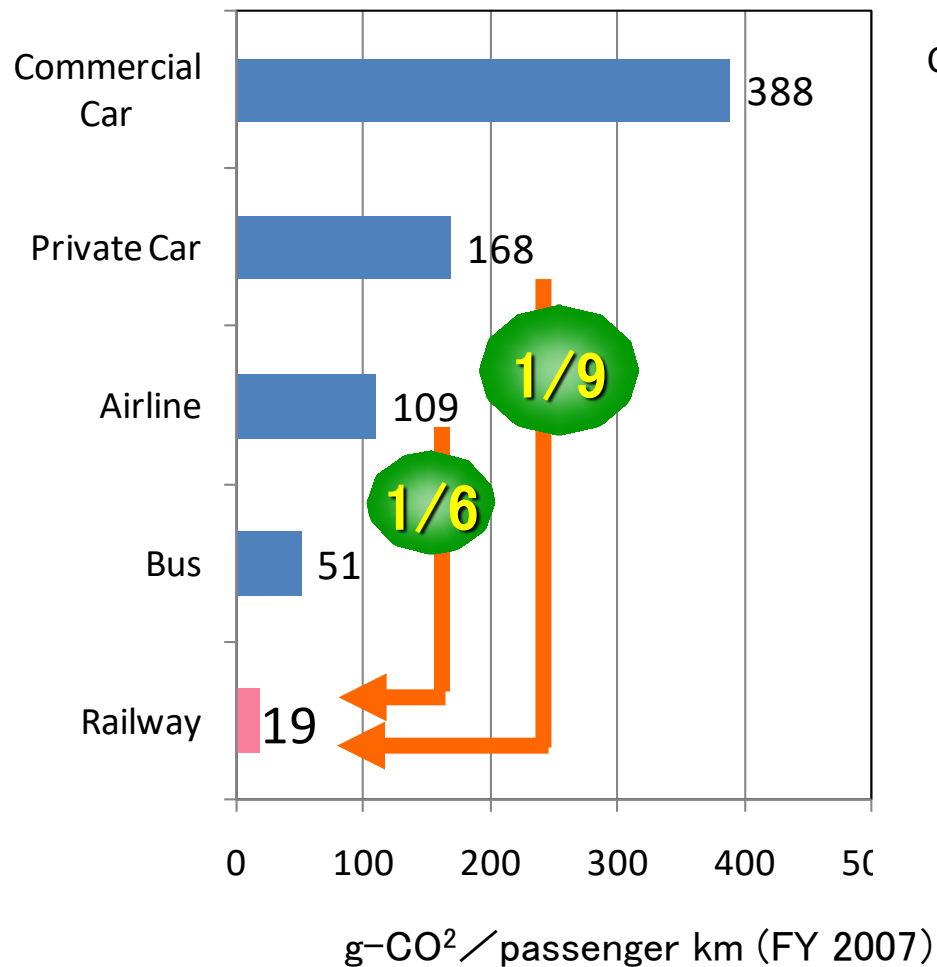
L-shape car guide

Deviation/Derailment Prevention Guard (Under development)

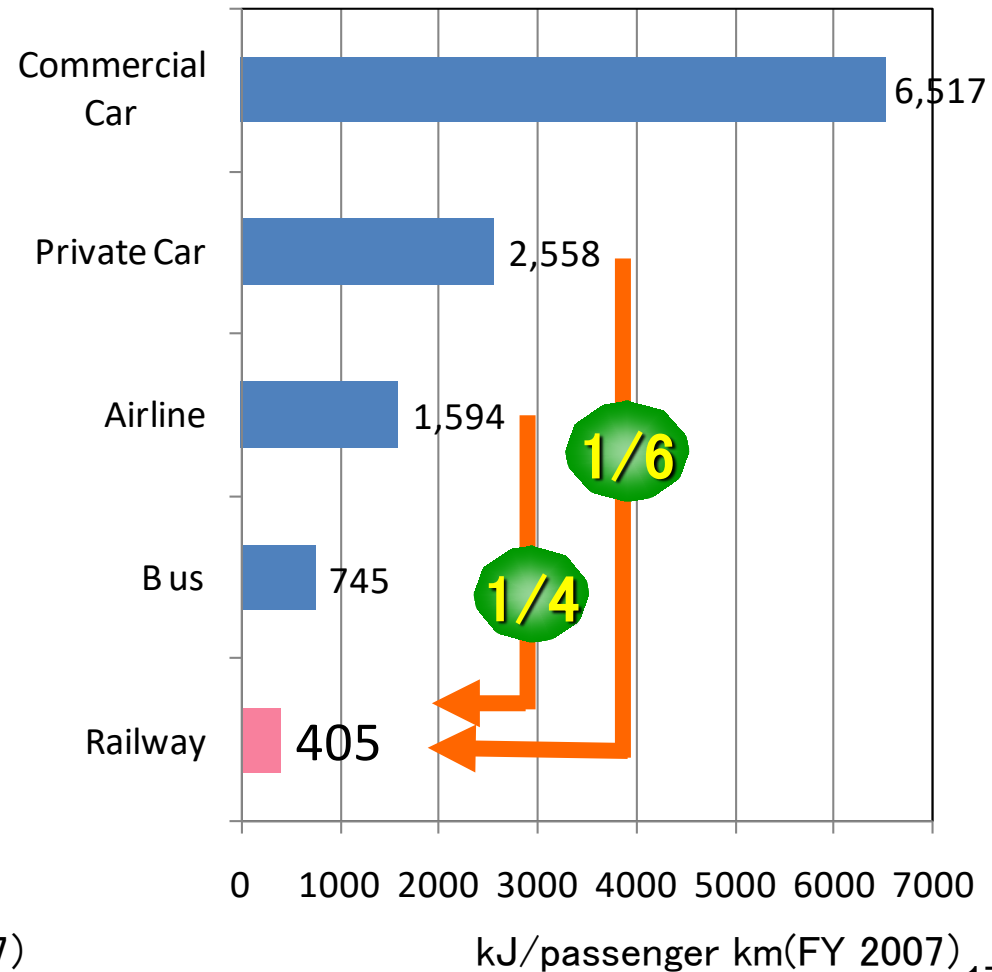
Measure for preventing a train from derailing and running out of the track, through installing a steel guard within a gauge.



Lower CO₂ emissions

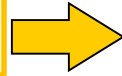


Less Energy Consumption



Environmentally Friendly

Lightweight

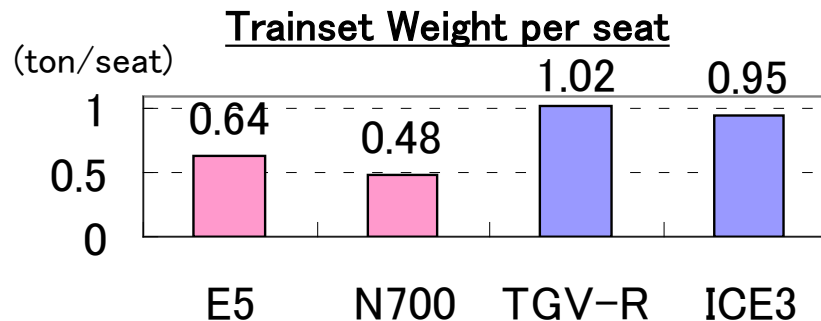


Low CO2 emissions & energy consumption

	Shinkansen (Series E5)	Shinkansen (Series N700)	TGV (TGV-R)*	ICE (ICE3)*
Trainset (cars)	10	16	20	16
Seats (num.)	713	1,323	750	858
Trainset Weight (ton) **	454	635	766	818
Trainset Weight/Seat (ton/seat)	0.64	0.48	1.02	0.95

*Coupling of trainsets

**Unloaded, approximate data(Series N700)



Current Noise-Collecting System



Pantograph Cover



Low-noise type
Pantograph

Noise from train bottom

- Lightening of car bodies
(Axle load)

Tokaido Shinkansen N700	11 ton
(ref.) European rapid trains	16-17 ton

- Smoothing surfaces of rails and wheels



Rail grinding

Aerodynamic Sound from upper part of train



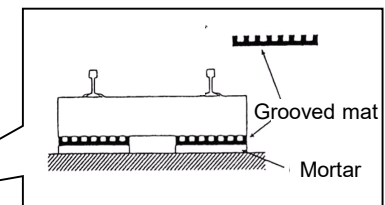
Stream-lined front



Smoothing of car
bodies

Noise from structures

- Slab Track (Vibration Isolation)



Slab Track

Noise Barrier



Interference-type
Soundproof Device

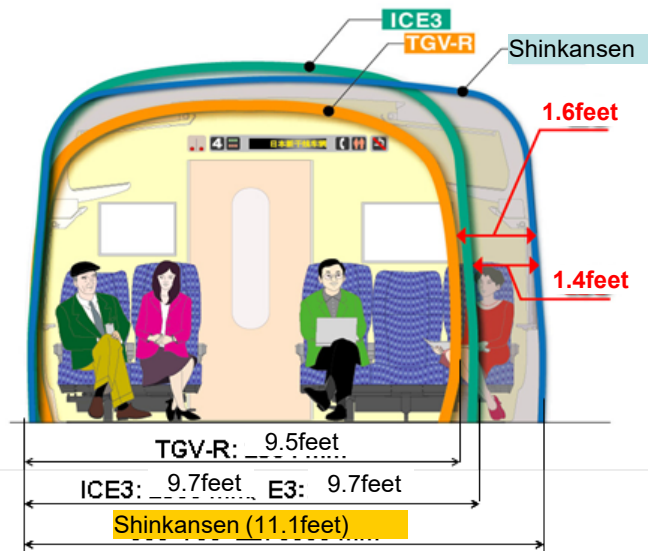


Inverted-L type
Noise Barrier

High Density...Up to 14 trains per hour

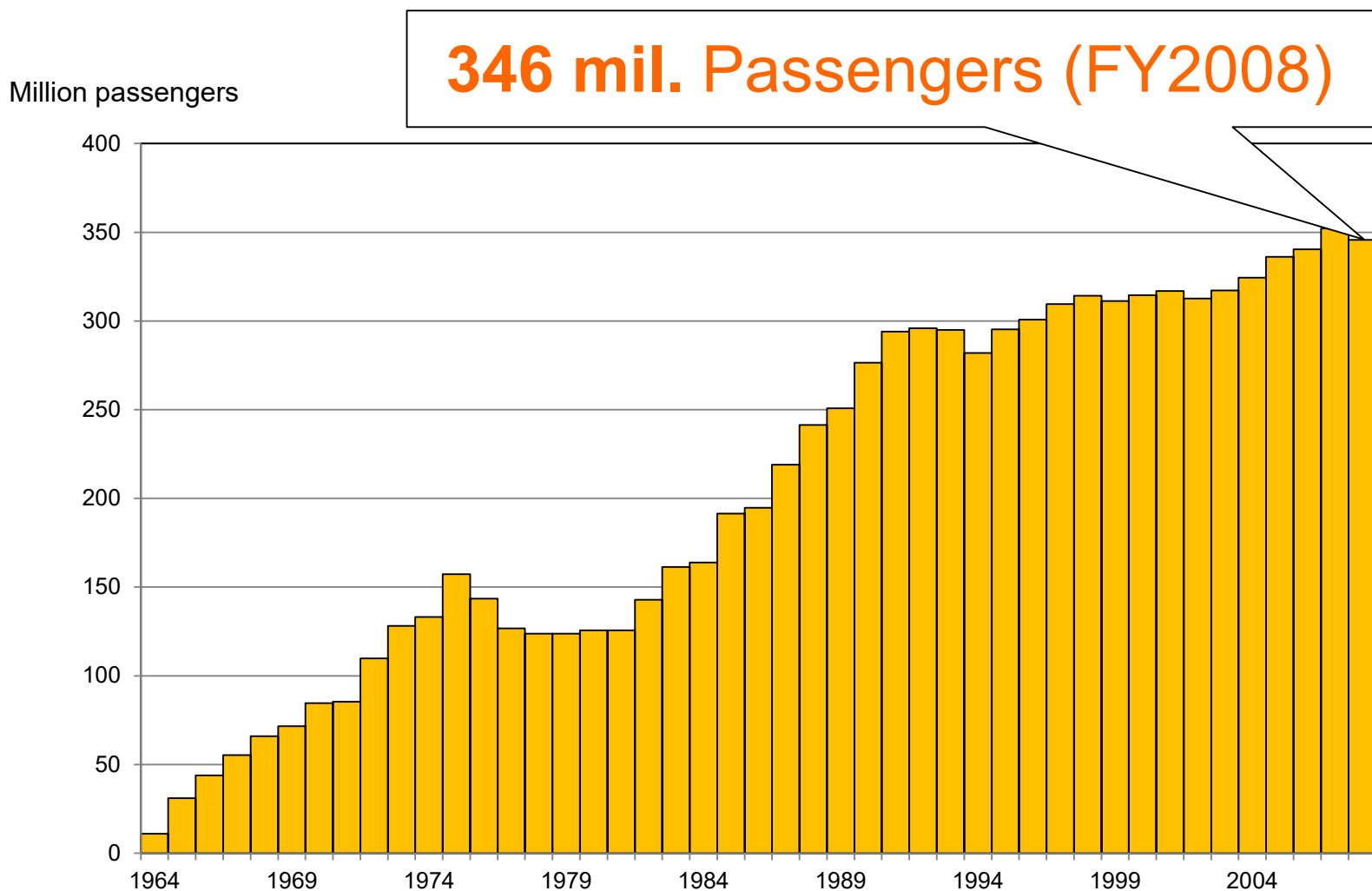
東海道・山陽新幹線 発車ご案内 Tōkaidō, Sanyō Shinkansen Departures					
列車名	列車番号	発車時刻	行先	のりば	
NOZOMI	105	8:50	Hiroshima	19	Non-Reserved Car No.1-3
KODAMA	641	8:56	Shin-ōsaka	15	Non-Reserved Car No.1-7,13-15
NOZOMI	215	9:00	Shin-ōsaka	16	Non-Reserved Car No.1-3
HIKARI	465	9:03	Okayama	18	Non-Reserved Car No.1-5
NOZOMI	15	9:10	Hakata	17	Non-Reserved Car No.1-3
NOZOMI	819	9:13	Shin-ōsaka	14	Non-Reserved Car No.1-3

Wider body...More seats



	Seat pitch (feet)	Passage width (feet)
Shinkansen	3.2 - 3.4	1.9 - 2.0
TGV-R	2.9	1.5
ICE3	3.0	1.8

The growth of the numbers of Shinkansen passengers

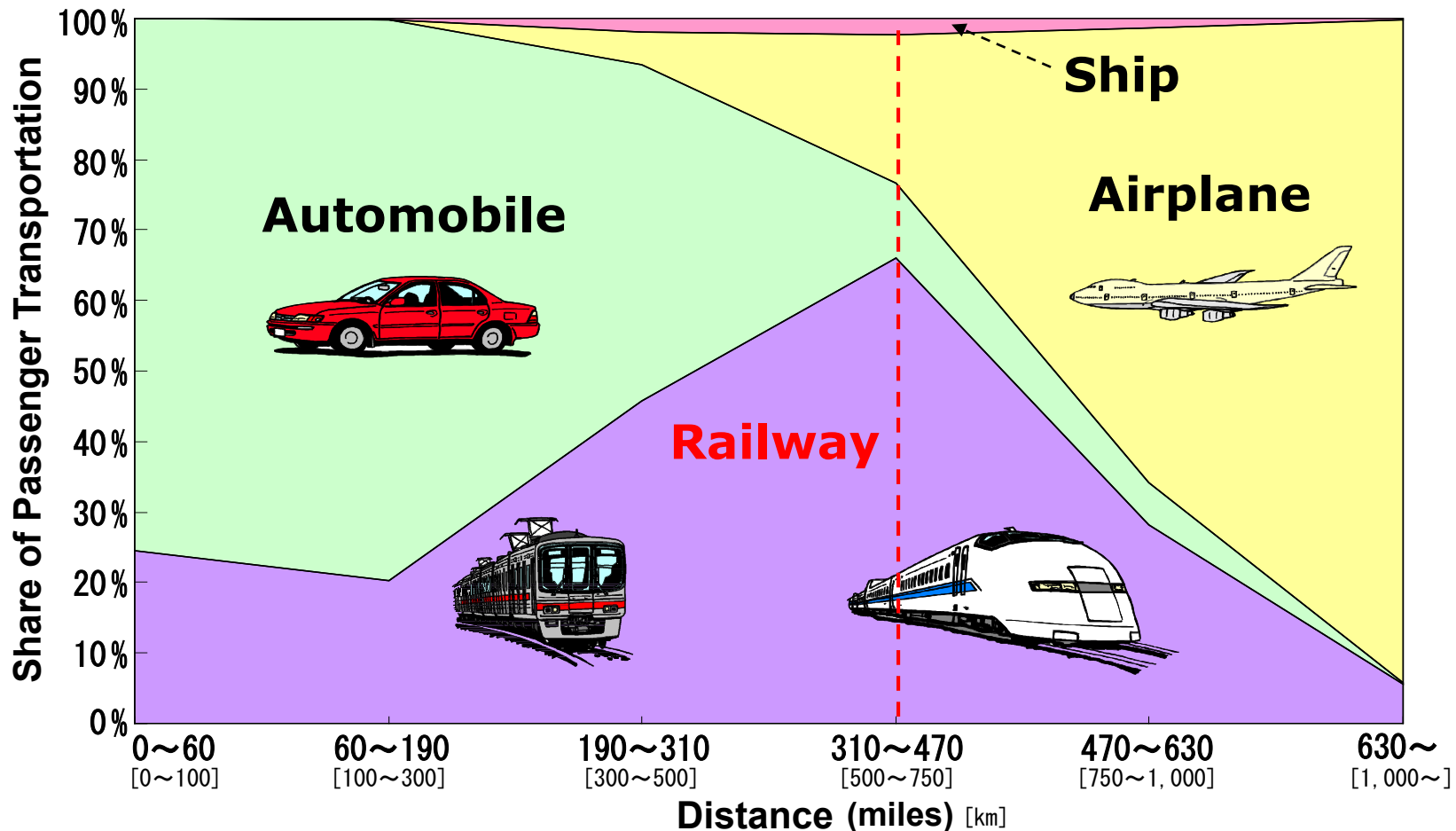


- Japanese rail technology has contributed to the success of the HSR in Taiwan, China, and UK.

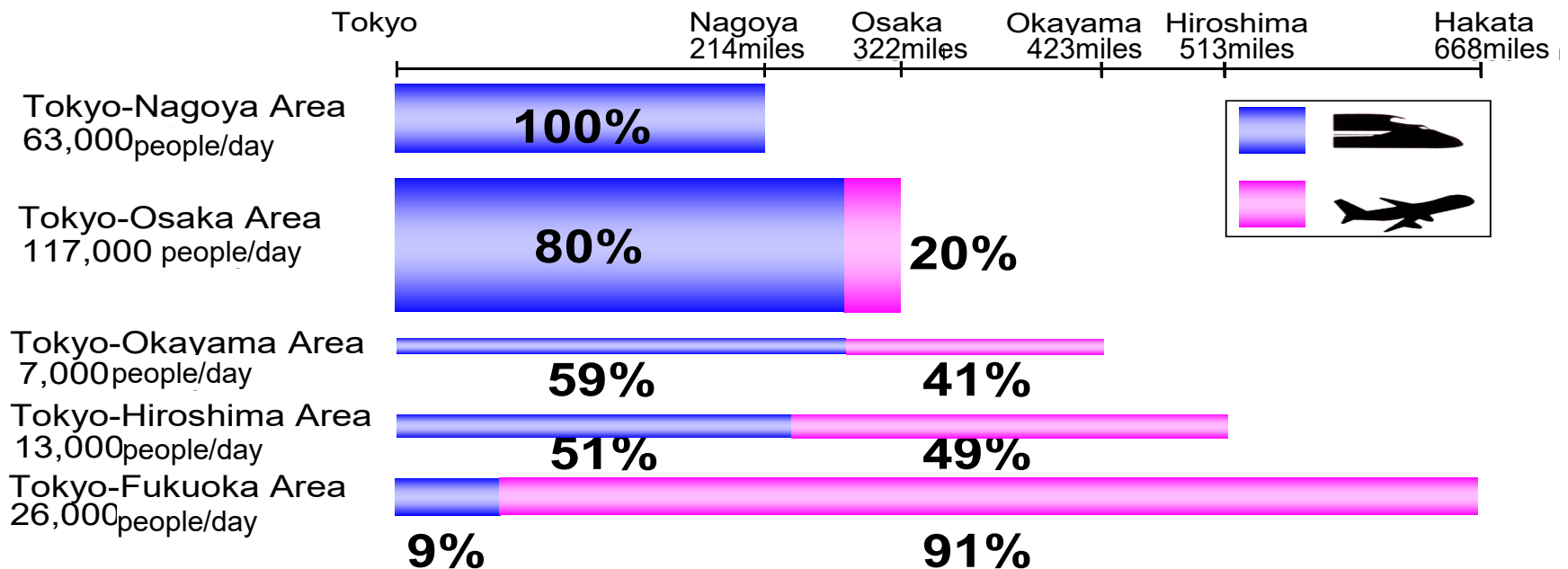


Share of Passenger Transport Modes According to Distance

The distance zone that Shinkansen demonstrates its competitiveness : 300~450miles (travel time: 2~4hrs.)

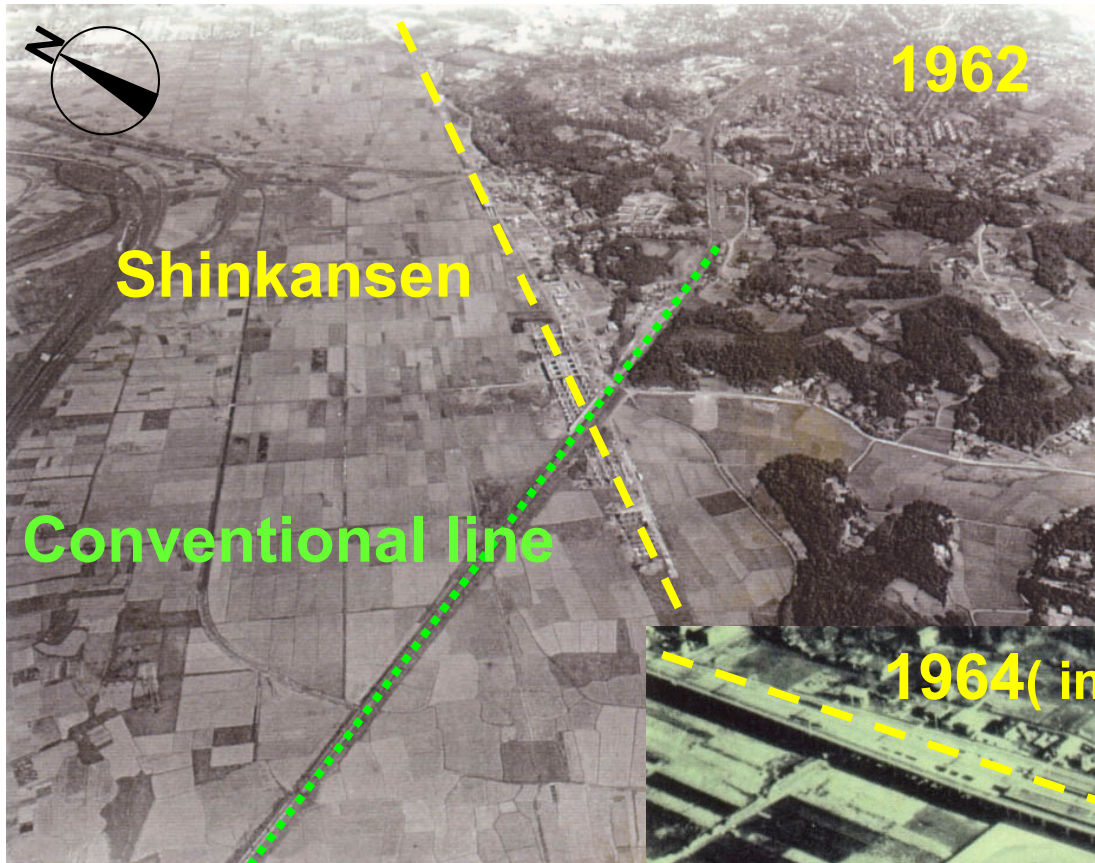


Share of Passenger Transport Modes in case of Tokyo-Fukuoka

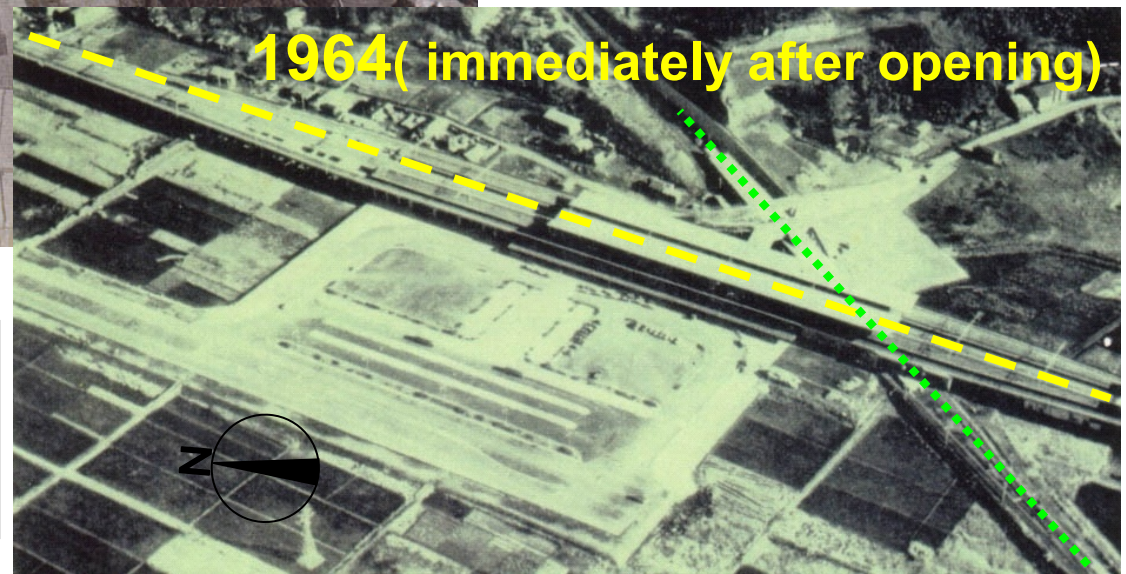


Source: Market share is the percentage of all railway and airline services based on the inter-prefectural data of the Inter-Regional Passenger Mobility Survey (FY 2005.3), published by the MLIT.

Area around Shin-Yokohama St.



In 1965, next year of Shinkansen opening, Land adjustment of 200 acre started and completed in 1980.



19miles from Tokyo Station
3.1miles from the center of
Yokohama-city

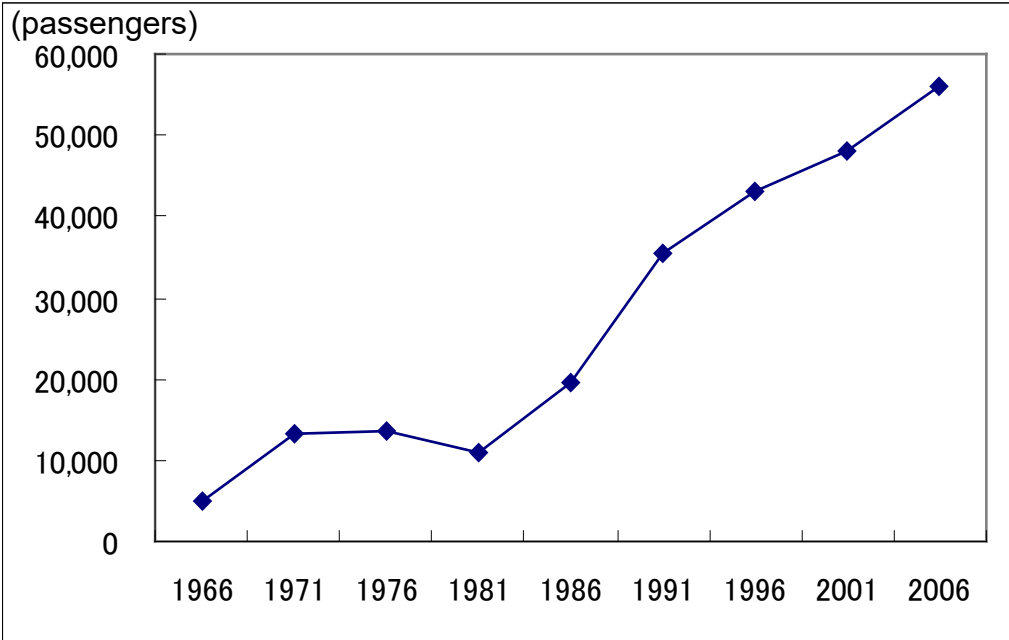
Area around Shin-Yokohama St.

Now... Front entrance of Yokohama City

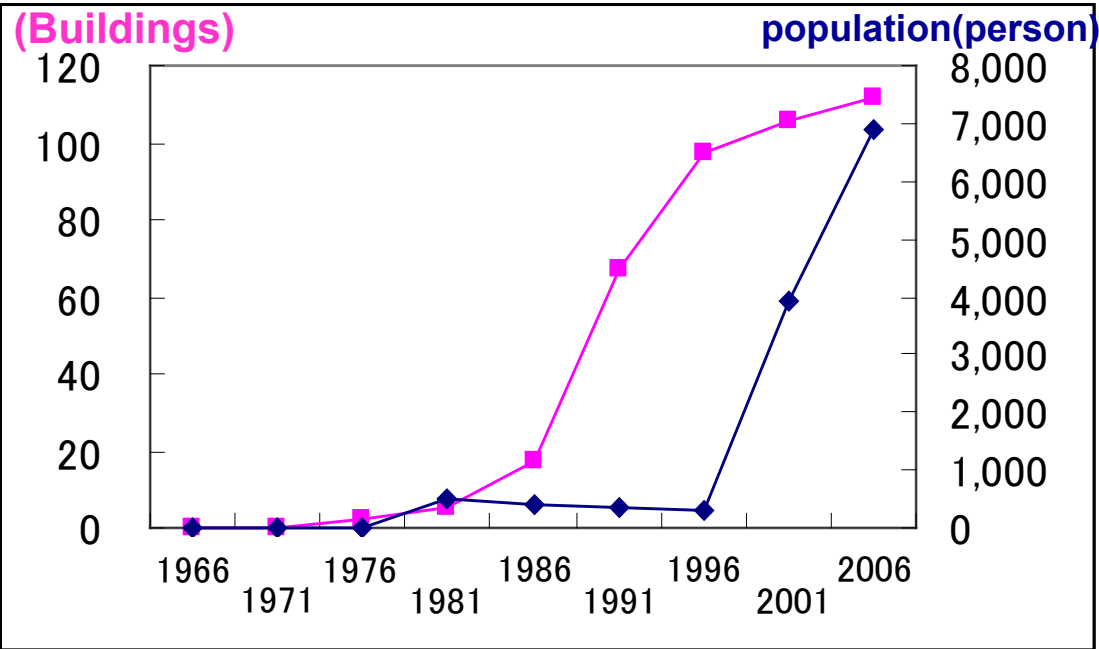
- Creation of new business area
- Connection with center city by subway (1985)
- Construction of event arena & sports arena (2002 FIFA World Cup)



The number of passengers using Shin-Yokohama St. of Shinkansen

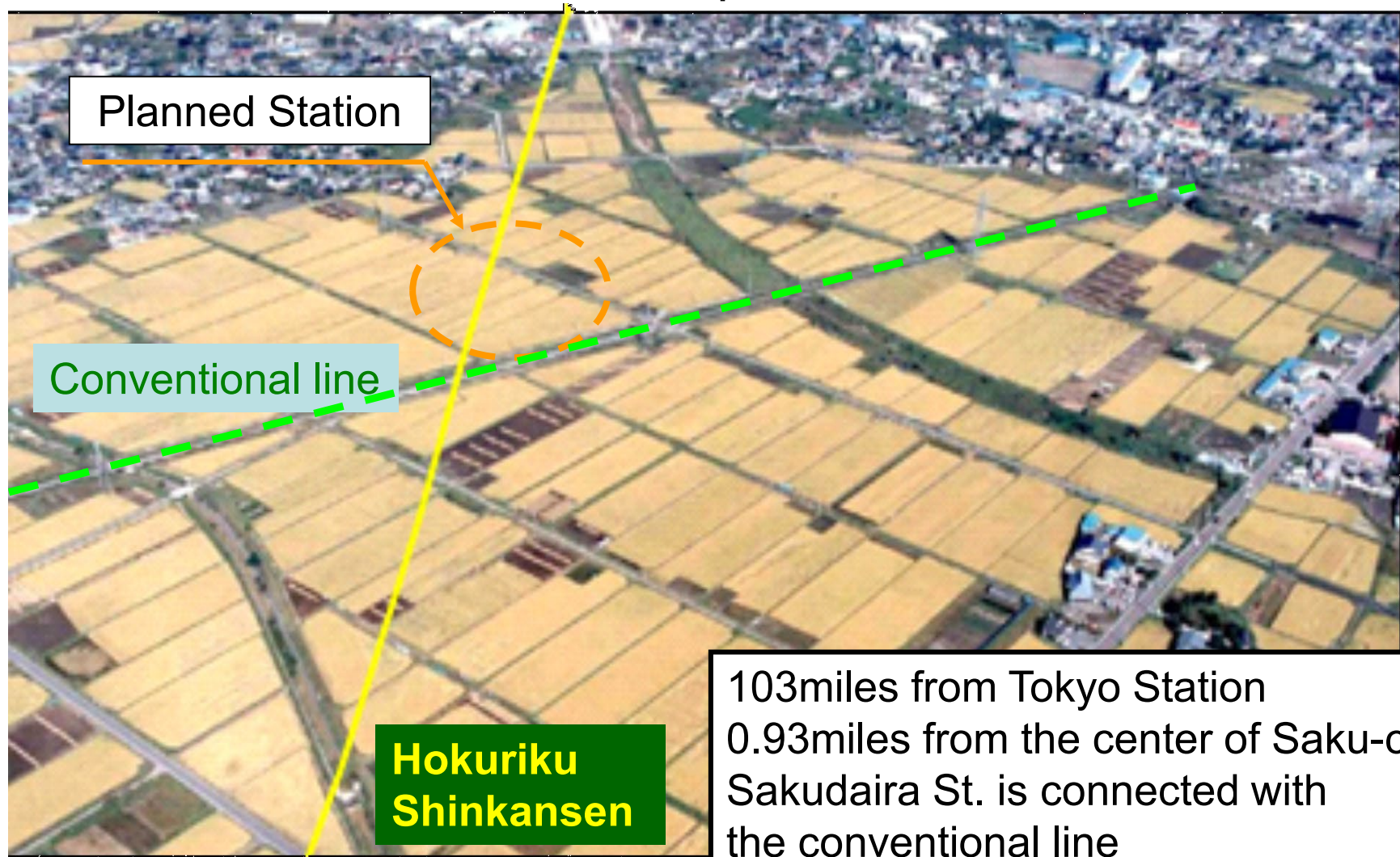


The number of commercial buildings and population around Shin-Yokohama St.

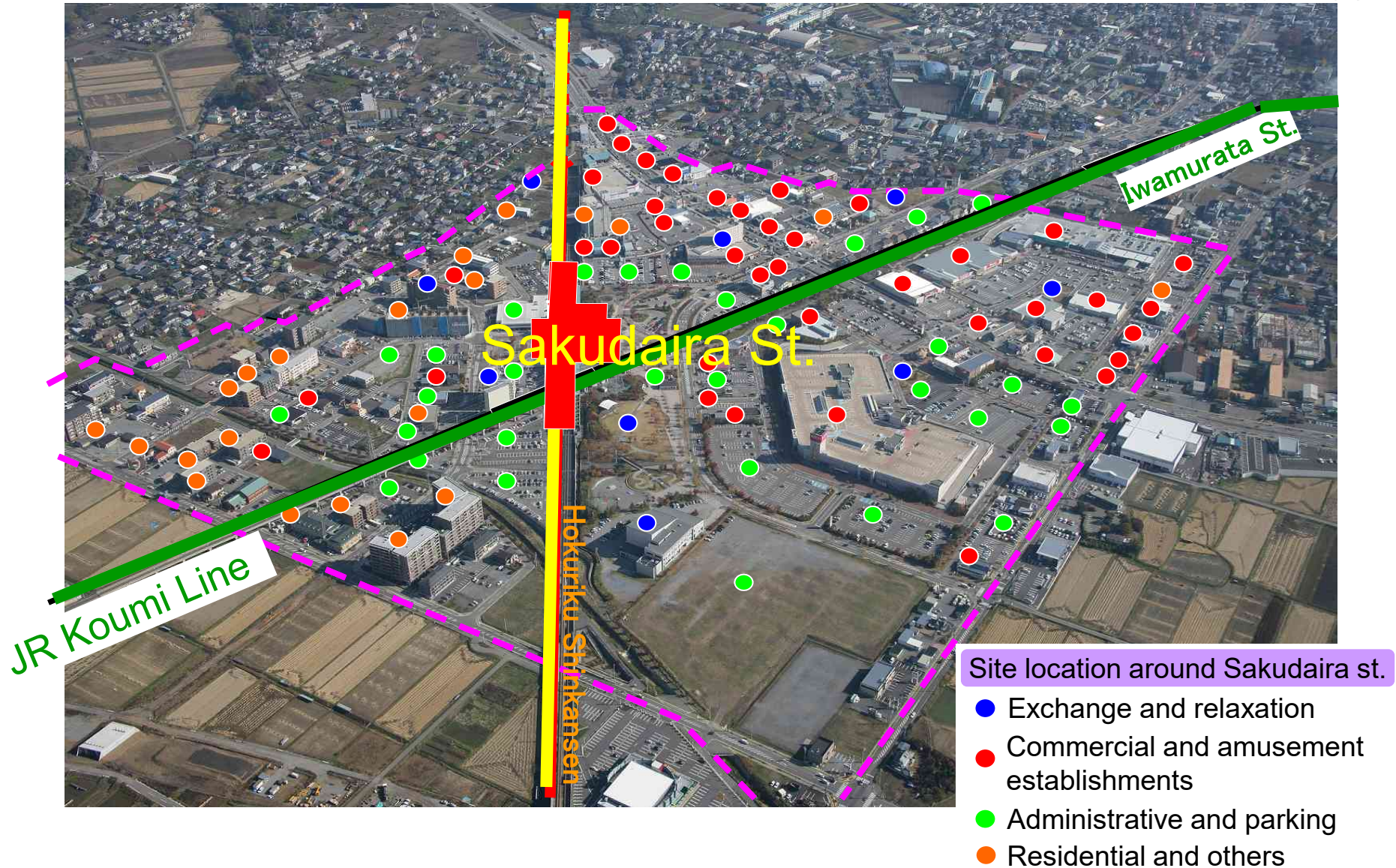


Area around Sakudaira St.

Before 148 acre development around the station

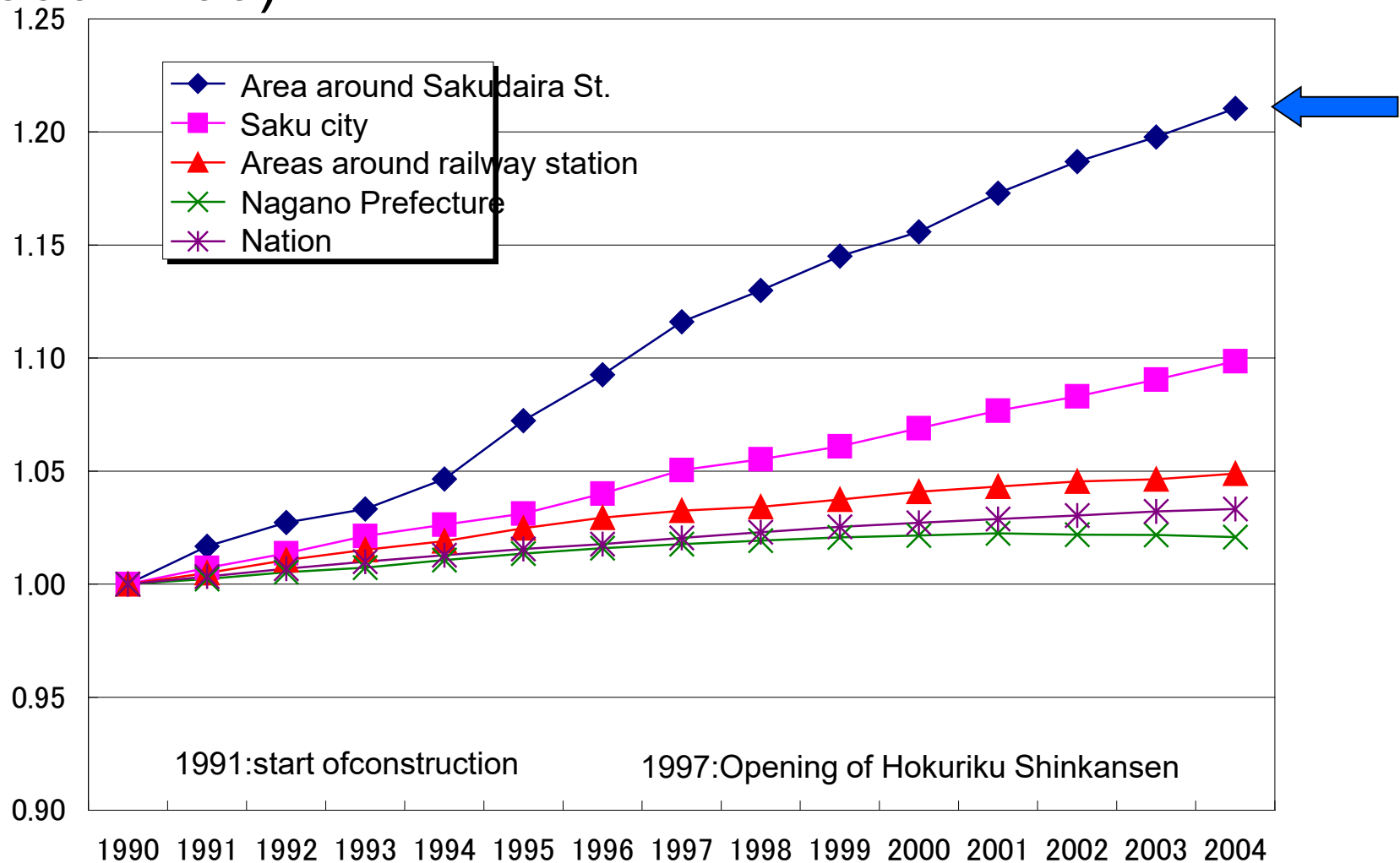


Area around Sakudaira St. (10 years after opening) = Year 2007



Increase of the population in the area around Sakudaira St.

(1990=1.00)



**Thank you
for your attention.**